ALBERTA OIL SANDS INDUSTRY

QUARTERLY UPDATE

FALL 2012

Reporting on the period: Aug. 22 to Nov. 2, 2012

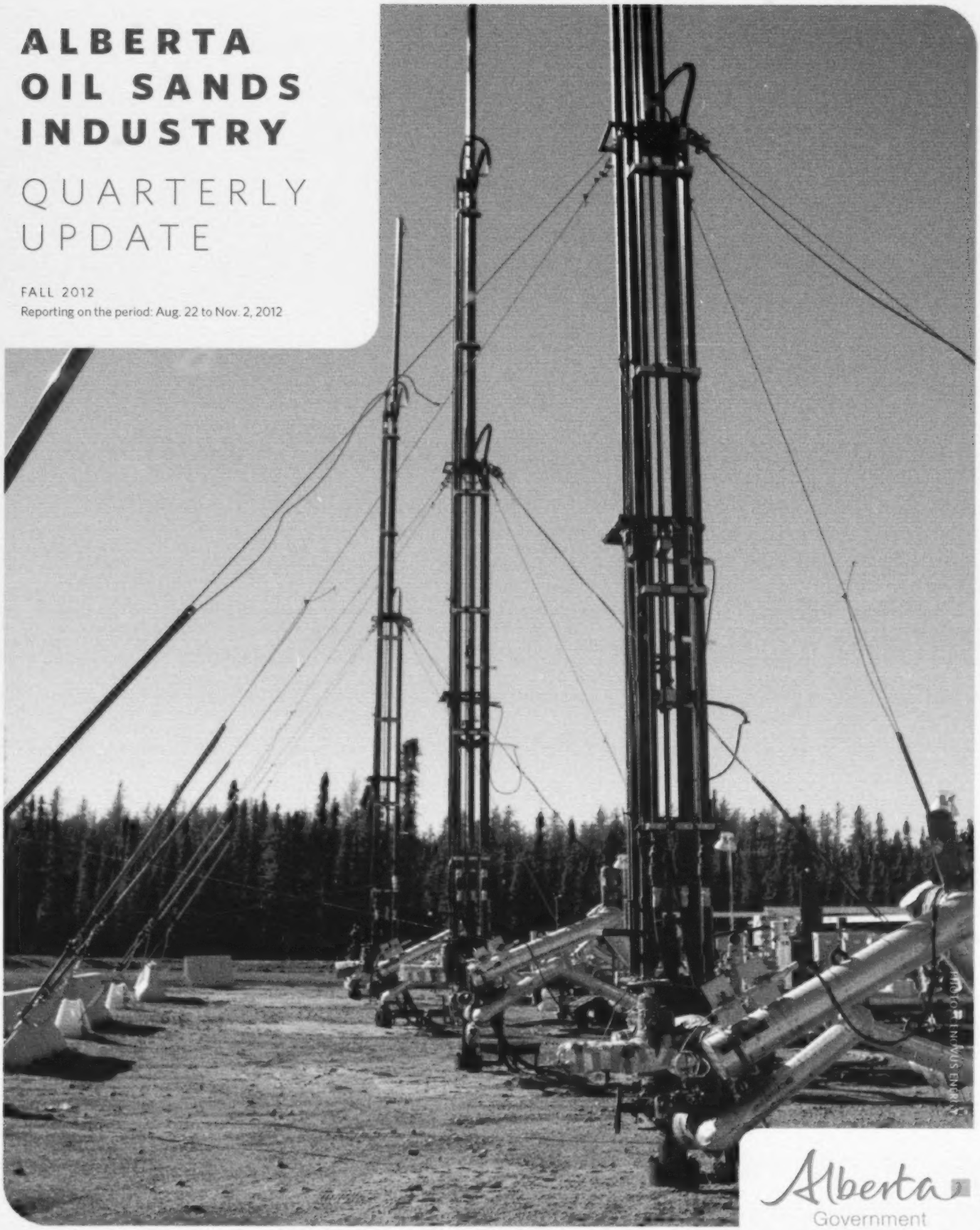

PHOTO: INNOVUS ENERGY

Alberta Government

All about the oil sands

Background of an important global resource

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Canada has the third-largest oil reserves in the world, after Saudi Arabia and Venezuela. Of Canada's 174 billion barrels of oil reserves, 170 billion barrels are located in Alberta, and about 169 billion barrels are recoverable from bitumen. This is a resource that has been developed for decades but is now gaining increased global attention as conventional supplies—so-called "easy" oil—continue to be depleted. The figure of 169 billion barrels of bitumen represents what is considered economically recoverable with today's technology, but with new technologies, this reserve estimate could be significantly increased. In fact, total oil sands reserves in place are estimated at 1.8 trillion barrels.

There are three major bitumen (or oil sands) deposits in Alberta. The largest is the Athabasca deposit, which is located in the province's northeast in the Regional Municipality of Wood Buffalo. The main population centre of the Athabasca deposit is Fort McMurray. The second-largest oil sands deposit is referred to as Cold Lake, just south of Athabasca, with the main population centre the City of Cold Lake. The smallest oil sands deposit is known as Peace River, which is located in northwest-central Alberta. A fourth deposit called Wabasca links to the Athabasca and is generally lumped in with that area.

The existence of bitumen in Alberta has been known for a long time. The first mention of it in Canadian history was in 1719, when a Cree named Wapasu brought a sample of the "gum" to a Hudson's Bay trading post. First Nations in what is now the Wood Buffalo area had traditionally used the bitumen, which seeps from outcrops along the Athabasca River, to waterproof their canoes.

Today, bitumen is produced as an energy source by two means—mining and in situ. In 2011, 51 per cent of oil sands production came from mines, but by 2015, in situ bitumen production is expected to surpass mined bitumen production. Alberta will need to rely to a greater extent on in situ production in the future, as 80 per cent of the province's proven bitumen reserves are too deep underground to recover using mining methods.

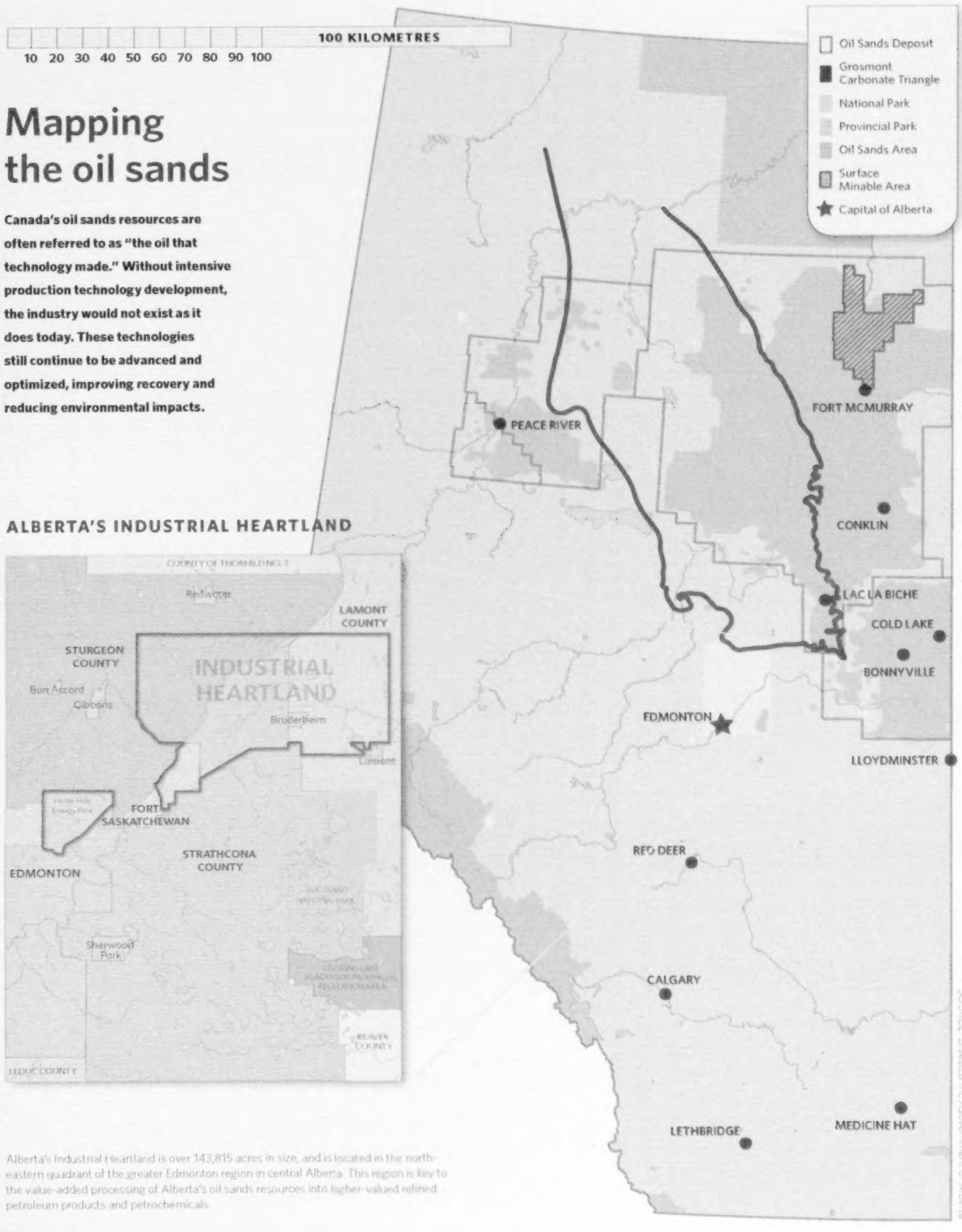
There are essentially two commercial methods of in situ (Latin for "in place," essentially meaning wells are used rather than trucks and shovels). In cyclic steam stimulation (CSS), high-pressure steam is injected into directional wells drilled from pads for a period of time, then the steam is left to soak in the reservoir for a period, melting the bitumen, and then the same wells are switched into production mode, bringing the bitumen to the surface.

In steam assisted gravity drainage (SAGD), parallel horizontal well pairs are drilled from well pads at the surface. One is drilled near the top of the target reservoir, while the other is drilled near its bottom. Steam is injected into the top well, a steam chamber forms, and the melted bitumen flows into the lower well via gravity and is pumped to the surface using artificial lift.

Both SAGD and CSS are used in the Cold Lake and Peace River deposits, while SAGD is the in situ technology of choice in the Athabasca deposit. The selection is based on a number of factors, including geology. The technologies combined currently produce just over one million barrels per day.

Research is underway on a number of other production technologies designed to optimize production, including variations on solvent-assisted SAGD and CSS, recovery using electricity, and in situ combustion.

Bitumen that has not been processed, or "upgraded," can be used directly as asphalt. It must be diluted to travel by pipeline. Adding value, some producers upgrade their product into synthetic crude oil, which is a refinery feedstock. That can be transformed into transportation fuels and other products. ■



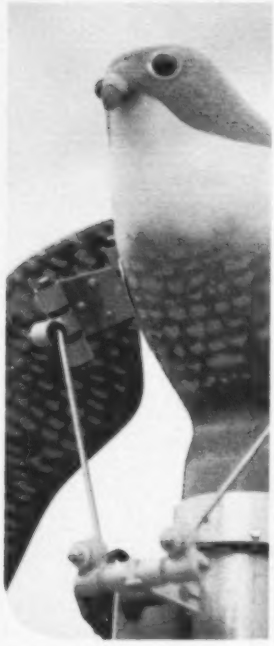
Mapping the oil sands

Canada's oil sands resources are often referred to as "the oil that technology made." Without intensive production technology development, the industry would not exist as it does today. These technologies still continue to be advanced and optimized, improving recovery and reducing environmental impacts.

Alberta's Industrial Heartland is over 143,815 acres in size, and is located in the north-eastern quadrant of the greater Edmonton region in central Alberta. This region is key to the value-added processing of Alberta's oil sands resources into higher-valued refined petroleum products and petrochemicals.

SOURCE: Dwelton Inc./Government of Alberta

GOVERNMENT UPDATE



ALBERTANS HELP SHAPE RESPONSIBLE GROWTH FOR OIL SANDS REGION

Alberta's first regional plan sets strong environmental limits, conserves sensitive lands, provides certainty to industry, diversifies the economy and offers numerous recreational opportunities in the Lower Athabasca region. More than 10,000 Albertans, including individuals, aboriginals, industry, municipalities, environmental organizations and other stakeholder groups, have been engaged in land-use planning—including three years and three rounds of consultation on the Lower Athabasca Regional Plan (LARP).

LARP is a comprehensive, forward-thinking and legally binding road map that enhances the Alberta government's environmental management, addresses growth pressures and supports economic development. It is the first of seven regional plans committed to Alberta's innovative Land-Use Framework, which is unprecedented in Canada.

The regional plan considers the cumulative effects of all activities on air, water and biodiversity. It establishes new environmental frameworks with limits to protect air and surface-water quality, and increases the total conserved land within the region to more than two million hectares, or three times the size of Banff National Park.

LARP, which took effect on September 1, sets the stage for the next 50 years, concentrating on environmental, economic and social actions by:

- Immediately setting regional environmental limits for air and surface-water quality, and regional groundwater management framework with interim triggers;
- Establishing six new conservation areas, bringing the total conserved land in the region to two million hectares, or 22 per cent of the region;
- Changing the Dillon River Conservation Area from a Public Land-Use Zone to a Wildland Provincial Park and increasing the size by 27,245 hectares to 191,544 hectares, thus securing a larger tract of important caribou habitat;
- Addressing infrastructure challenges and new strategies to plan for urban development around Fort McMurray;
- Providing year-round tourism and recreational opportunities through the creation of nine new provincial recreational areas, which will have access to campsites, trails and boat docks;
- Committing to a regional trail system plan;
- Committing to the development of tailings management, biodiversity and surface-water quantity frameworks;
- Committing to engage and work with aboriginal communities on initiatives to incorporate traditional knowledge into environmental planning;
- Identifying opportunities to engage with aboriginal communities on initiatives to support tourism development;
- Providing certainty for industry in development of the oil sands; and
- Supporting diversification of the regional economy—recognizes tourism and recreational opportunities, the potential for further responsible development of energy, minerals, coal, surface materials, forestry and agriculture.

For more information on the regional plan, visit www.landuse.alberta.ca.

ALBERTANS TO BENEFIT FROM A MORE EFFICIENT, EFFECTIVE REGULATORY SYSTEM

Alberta is taking a bold step that will improve the energy regulation system for landowners, industry and the environment. Bill 2: The Responsible Energy Development Act, creates a single provincial regulator for upstream energy resource activities involving oil, gas, oil sands and coal.

The new regulator will be a unified one-window approach that makes it easier to navigate the system. It will also be responsible for energy resource developments from initial application to reclamation.

Under the proposed legislation, the single regulator will assume the regulatory functions of the Energy Resources Conservation Board (ERCB) and Alberta Environment and Sustainable Resource Development, with respect to oil, gas, oil sands and coal development. The arm's-length agency will be governed by a board of directors, with a chief executive officer at the helm. It is expected to be operational by June 2013.

Highlights of the Responsible Energy Development Act include:

- Higher fines for individuals and companies who break the law;

PHOTO: CENOVUS ENERGY

- Voluntary registry for landowners to register private surface agreements, which can then be enforced;
- Increased flexibility for the regulator to receive and process applications in a way that supports effective and fair decision making.

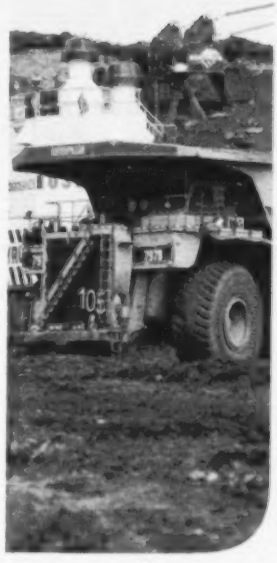
This single regulator is a crucial component of the province's plan to better manage its resources in an integrated manner. It builds on the Lower Athabasca Regional Land-Use Plan that came into effect September 1, and the recently announced arm's-length environmental monitoring agency.
A copy of the draft legislation can be found at www.assembly.ab.ca.

ALBERTA TO ESTABLISH ARM'S-LENGTH ENVIRONMENTAL MONITORING AGENCY

Alberta will build the most comprehensive environmental monitoring program in Canada with the establishment of a new arm's-length environmental monitoring agency.
The agency will be built on credible science, research and data collection. This is the key recommendation of the independent Environmental Monitoring Working Group report released by the Alberta government. The new science-based agency will begin work in the oil sands region and will focus on what is monitored, how it's monitored and where it's monitored. This will include integrated and coordinated monitoring of land, air, water and biodiversity.
A management board named by Environment and Sustainable Resource Development Minister Diana McQueen will immediately begin work to set up the new agency.
The work of the six-member management board will focus on how the new science-based agency will operate, long-term funding options and establishing a Science Advisory Board to provide input and advice on monitoring efforts. The initial focus of the new arm's-length agency will be on the Lower Athabasca area with the ability to expand to the rest of the province.
While the new agency is being established, environmental monitoring in the oil sands region will continue through a joint federal-provincial program announced in February. To date, that program has added new water-quality sites on the Athabasca River and Muskeg River system, increased air monitoring by adding more sampling sites, and improved biodiversity monitoring to include all oil sands producing areas.
The full report of the Environmental Working Group is available online at http://environment.alberta.ca/03379.html.

OIL SANDS INVESTMENT EXPECTED TO GENERATE ECONOMIC BENEFITS IN ALL PARTS OF CANADA

Nearly one-third of the economic benefits of oil sands investment between 2012 and 2035 will occur in provinces other than Alberta, according to a Conference Board of Canada report assessing the impact of an estimated $364-billion investment on Canada's regions and industry sectors. Much of the economic benefits outside Alberta will be in Ontario and British Columbia.
The findings of the report, *Fuel for Thought: The Economic Benefit of Oil Sands Investment for Canada's Regions*, were presented at the National Buyer/Seller Forum in Edmonton in October.
In addition to the direct effects associated with spending on new projects, as well as spending on improvements, maintenance and repairs to capital assets, this study considers supply chain effects—employment associated with the use of intermediate inputs or other support services that are part of oil sands investment. The research also includes income effects, which occur when the wages that employees earn from the direct and supply chain effects are spent.
The study breaks this employment impact down as direct effects in the construction industry of 880,000 person-years of employment; supply chain effects of 1.45 million person-years of employment in a variety of industries, but predominately in oilfield services, professional services, manufacturing, wholesale trade, financial services, and transportation; and income effects of 880,000 person-years of employment resulting from the spending of wages and salaries, estimated at $172 billion.
These figures include only the effects of investment; the production that would result from the investments would generate additional employment and supply chain effects.
The majority of the supply chain employment effects (70 per cent) will occur in Alberta. The supply chain effects in Alberta are geared toward industries where oil and gas in general, and oil sands in particular, are a major source of revenues. ➤



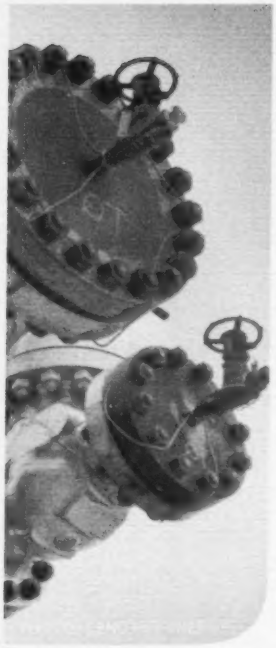


PHOTO: CENOVUS ENERGY

Nevertheless, nearly one-third of supply chain effects will occur in other provinces (broken down by share of the national total):

- Ontario (14.8 per cent): Above-average employment effects (compared to the province's share of overall effects) will occur in services, but also in manufacturing inputs for the oil sands. Manufactured inputs account for one-fifth of the manufacturing employment effects.

- British Columbia (6.7 per cent): In the B.C. goods sector, miscellaneous plastic products (such as plastic building materials and plastic storage tanks), paper products and wood products, all experience outsized (above-average) effects. So do services like scientific services, legal and accounting services, computer services, and transportation and travel-related industries.

- Quebec (3.9 per cent): Supply chain effects are tied to the large businesses that are headquartered in Quebec, such as CGI for computer services and CN for rail transportation.

- The Prairies (3.7 per cent): The Prairie region's role as a transportation hub between eastern and western Canada is apparent—as rail and truck transportation experience outsized effects. Industries such as steel mills, metal tanks, steel pipes and tubes, printing, and medical equipment and supplies also gain from supply chain effects related to oil sands investment.

- Atlantic Canada (0.8 per cent): Industries that have above-average effects include ornamental and architectural metal products, construction machinery, navigational, measuring, medical and control instruments, and tire manufacturing.

Beyond the employment impacts, oil sands-related investment is expected to generate government revenues of $79.4 billion ($45.3 billion in federal revenues and $34.1 for provinces) between 2012 and 2035, on an inflation-adjusted basis. This includes the effects of personal income taxes, corporate profit taxes and indirect taxes (such as sales taxes and taxes on fuel).

The investment forecast is based on assumptions that oil sands resources will be developed under certain market conditions, but a number of factors could affect the level of investment over the next 25 years. These include capacity constraints in the oil sands region, the possibility for global oil supply or demand to behave differently than expected, and the need to mitigate risks associated with the environmental footprint of the oil sands.

The study was funded by the Government of Alberta and Industry Canada. It is publicly available at the Conference Board's e-library.

SHELL TO CONSTRUCT WORLD'S FIRST OIL SANDS CCS PROJECT

Shell announced in September that it will go ahead with the first carbon capture and storage (CCS) project for an oil sands operation in Canada.

The Quest project will be built on behalf of the Athabasca Oil Sands Project joint venture owners (Shell Canada Ltd., Chevron Corporation and Marathon Oil Corporation), and with support from the Governments of Canada and Alberta.

The Athabasca Oil Sands project produces bitumen, which is piped to Shell's Scotford Upgrader near Edmonton. From late 2015, Quest will capture and store, deep underground, more than one million tonnes per year of CO_2 produced in bitumen processing. Quest will reduce direct emissions from the Scotford Upgrader by up to 35 per cent—the equivalent of taking 175,000 North American cars off the road annually.

Both the federal and provincial governments have identified CCS as an important technology in their strategies to reduce CO_2 emissions. The Alberta government is investing $1.5 billion over 15 years in three CCS projects, with $745 million being provided to support Quest, while the Government of Canada will invest $120 million through its Clean Energy Fund.

ERCB APPROVES ENBRIDGE PIPELINE APPLICATION

The ERCB issued Decision 2012 ABERCB 009, which approves Enbridge Inc. applications to construct and operate two pump stations and a pipeline that would transport diluted bitumen from Fort McMurray to Sherwood Park.

The proposed pipeline route parallels several existing pipelines and is approximately 385 kilometres in length. It is proposed to transport an initial capacity of 400,000 barrels per day of diluted bitumen containing no hydrogen sulphide.

RESEARCH AND INNOVATION TO BENEFIT FROM TAX CREDIT CHANGES

Changes to the Scientific Research and Experimental Development Tax Credit included in the new Corporate Tax Amendment Act will enhance annual benefits to Alberta research companies by $25 million per year.

This tax credit is a program that provides a refundable tax credit to corporations for research and development in Alberta.

"The Scientific Research and Experimental Development Tax Credit changes are good news for Alberta entrepreneurs and researchers," said Doug Horner, president of the treasury board and minister of finance. "The changes will make more funds available to support research and Alberta companies, as well as make our program more competitive with other jurisdictions."

As originally announced in Budget 2012, Bill 9 eliminates a requirement to deduct the federal investment tax credit when calculating Alberta's tax credit. The bill also extends the filing deadline for the tax credit by three months. This means that some corporations, whose claims were rejected because they were made after the original deadline, will be eligible for the credit. ■

What's new in the oil sands

BUSINESS

PHOTO: CENOVUS ENERGY

■ The Alberta Court of Queen's Bench has approved an agreement by Cenovus Energy Inc. to purchase the remaining assets of Oilsands Quest Inc. for $10 million. The acquisition covers about 59,000 hectares in Alberta and Saskatchewan that adjoin to Cenovus's Telephone Lake property.

Late last year, Cenovus submitted a joint regulatory application and environmental impact assessment for an initial 90,000-barrel-per-day project at Telephone Lake. Ultimately, the company expects this asset to become another cornerstone project like Foster Creek or Christina Lake.

■ Baytex Energy Corp. has agreed to acquire a 100 per cent working interest in 46 sections of undeveloped oil sands leases in the Cold Lake area of northeastern Alberta for $120 million.

Regulatory approval has been received for the construction and operation of a steam assisted gravity drainage (SAGD) project, the planned Gemini installation put on the block by Koch Exploration Canada earlier this year.

■ Canadian Oil Sands Limited has announced that Syncrude Canada Ltd. will pursue a mine-extension project at Mildred Lake known as MLX. The proposed project should enable Syncrude to extend the life of mining operations at Mildred Lake by about a decade. Project scoping is currently underway, and, pending regulatory approval, construction and spending would begin in the next 10 years. Initial project scoping is underway and Syncrude anticipates filing a formal regulatory submission in 2014.

■ Osum Oil Sands Corp. has received regulatory approval for the development of a 35,000-barrel-per-day thermal oilsands project near Cold Lake. The Taiga project would use both SAGD and cyclic steam stimulation recovery processes. With regulatory approval now in hand the timing of development and its funding options are under evaluation.

■ Southern Pacific Resource Corp. has announced that sales of diluted bitumen (dilbit) have commenced from its STP-McKay thermal project north of Fort McMurray, Alta.

"On October 24, 2012, the first load of dilbit was hauled by truck for sale to an intra-Alberta market," the company says. "Since then, approximately 9,000 barrels of dilbit have been hauled for sale to several local markets."

■ Surmont Energy Ltd. has filed its applications for the 12,000-barrel-per-day Wildwood SAGD project, located approximately 65 kilometres south of Fort McMurray. Production is forecasted to begin in 2015 or 2016, and to ramp up to full capacity over one to two years. Peak production is projected to continue for about 15 years, with an overall project life of 24 years or more.

■ Penn West Petroleum Ltd. and partner China Investment Company are seeking regulatory approval for a thermal in situ project with capacity of up to 10,000 barrels per calendar day at Seal in the Peace River oilsands. Construction on the horizontal cyclic steam stimulation project is expected to begin in the first quarter of 2014 with first steam anticipated in the second quarter of 2015.

■ Suncor Energy Inc.'s Firebag SAGD project has now reached record, and sustained production of nearly 120,000 barrels per day. First oil at Stage 3 was brought online in August of last year and with the application of infill well technology, the pace of production ramp-up exceeded previous expectations.

In addition, the Firebag Stage 4 facility was safely commissioned during the third quarter of this year and steaming of the wells has begun. First oil is expected by year end, approximately three months ahead of the original schedule, and the project is approximately 10 per cent under the current budget estimate of $2 billion.

■ Canadian Natural Resources Limited and its partner North West Upgrading Inc. will proceed with construction of their planned Redwater bitumen refinery.

North West Redwater Partnership (the 50/50 joint venture between North West Upgrading and CNRL) says the cost estimate for the 50,000-barrel-per-day first phase of the bitumen refinery is $5.7 billion. It is expected to take about three years to build with "above-ground" construction starting next spring.

The North West Redwater refinery will process 37,500 barrels per day of the Alberta government's royalty bitumen (under a 30-year fee-for-service tolling agreement) and 12,500 barrels per day of CNRL's in situ bitumen production.

What's new in the oil sands

TECHNOLOGY

PHOTO: IMPERIAL OIL

There is no "silver-bullet" technology that can address all tailings challenges at all oil sands mining sites, but an industry/government collaborative group has now identified nine "suites" of promising technologies whose implementation should be sped up. Nine tailings technology deployment plans, or "road maps," were developed by the Tailings Technology Roadmap and Action Plan project, released this summer.

The project has been a collaboration of Alberta Innovates - Energy and Environment Solutions (AI-EES) and the Oil Sands Tailing Consortium in partnership with Alberta Energy, Natural Resources Canada, Alberta Environment and Sustainable Resource Development, and Alberta's Energy Resources Conservation Board.

All Alberta oil sands miners shared their in-development tailings technologies. The operators, together with AI-EES, will be examining the recommendations of the road map project over the following months and will be planning and implementing demonstrations of these suites of technologies beginning in early 2013.

Athabasca Oil Corporation has awarded General Electric Company (GE) a contract to design and supply an integrated evaporator system for its 12,000-barrel-per-day Hangingstone oil sands operation in the South Athabasca region. GE will be providing Athabasca with two evaporator units, which GE says will include split sump design for enhanced energy efficiency. "The system also will incorporate GE's fifth-generation module design to meet the customer's need for an enhanced project schedule and cost certainty," the company says.

GE says it will deliver the equipment to the site in the third quarter of 2013 with commercial operation of the Hangingstone project expected to begin in 2014. Athabasca Oil received regulatory approval for the Hangingstone project during Q3/2012.

In an effort to further reduce CO_2 emissions at its Horizon oil sands project, Canadian Natural Resources Limited has entered into a long-term gas processing agreement with Williams Energy Canada where Williams will invest approximately $500 million to $600 million to extract, transport, fractionate, own and market natural gas liquids and olefins captured from the offgas produced at the Horizon upgrader.

Following the targeted expansion of Horizon to approximately 250,000 barrels per day of production capacity, CO_2 and sulphur emissions are targeted to be reduced, from levels that would otherwise be produced in the absence of such technology, by approximately 200,000 tonnes per year of CO_2 and 2,000 tonnes per year of sulphur through the capture of offgas.

Privately held Value Creation Inc. has filed an application with the Energy Resources Conservation Board for a proposed $3.39-billion SAGD project in the Athabasca oil sands that will use the company's proprietary bitumen processing and upgrading technology in the field.

The ATS project will have a central processing facility comprised of VCI's proprietary Accelerated Decontamination (ADC) bitumen processing and upgrading unit, along with other typical SAGD infrastructure. The ADC technology is designed to process the SAGD produced fluid directly from the wells and convert the produced fluids to a higher-quality and value-premium heavy oil or decontaminated oil (DCO), asphaltenes and water. The DCO may be blended with diluent to create a premium medium oil, Value Creation Medium (VC-M) oil.

The first phase (ATS-1) will produce bitumen emulsion containing 15,000 barrels per day of bitumen with the bitumen emulsion converted to 12,750 barrels per day of decontaminated oil using the ADC technology. The decontaminated oil will be blended with diluent to produce 15,938 barrels per day of VC-M oil.

The integration of VCI's technology with SAGD will support Alberta's policy objective of higher value-added oil sands production in Alberta, says Value Creation in its application. ATS-1 will also demonstrate the lower operating and capital costs of VCI's technology, it says. Subject to regulatory approval, construction of ATS-1 is expected to begin in 2014 with an anticipated operational start date two years later in 2016.

OIL SANDS PROJECT TECHNOLOGY GUIDE

CSS—CYCLIC STEAM STIMULATION
CSS involves injecting high-pressure steam into the reservoir for several weeks, followed by several weeks where the reservoir is left to "soak." The heat softens the bitumen and the water dilutes and separates the bitumen from the sand. The pressure creates cracks and openings through which the bitumen can flow back into the steam injector wells, which are converted to production mode.

ET-DSP—ELECTRO-THERMAL DYNAMIC STRIPPING
ET-DSP combines the majority of the dominant heat transfer mechanisms to heat and mobilize bitumen in situ. Electrodes are placed in a grid configuration and a production well is located within the centre of each series of electrode wells. The technology has been commercially applied for soil remediation and is expected to reduce greenhouse gas emissions and water use.

N-SOLV
N-Solv involves the injection of pure, heated solvent vapour into an oil sands reservoir where it condenses, delivering heat to the reservoir and subsequently dissolving the bitumen, with the resulting miscible liquids flowing by gravity to a production well. It is designed to accelerate extraction rates and reduce greenhouse gas emissions.

SAGD—STEAM ASSISTED GRAVITY DRAINAGE
SAGD employs two parallel horizontal wells: one injection well near the top of the reservoir, through which high-pressure steam is continuously injected, and one production well near the bottom of the reservoir into which the softened bitumen continuously flows and can be pumped to the surface. SAGD surface facilities include steam generation, water processing and bitumen treatment. Multiple operators are also now working with solvent co-injection in SAGD to increase recovery and reduce natural gas and water requirements.

SURFACE MINING
Integrated oil sands mining operations accomplish three main functions: mining the oil sands, separating the bitumen from the sand and upgrading the bitumen so refiners can work with it.

TAGD—THERMAL ASSISTED GRAVITY DRAINAGE
TAGD is a process being developed for the in situ recovery of bitumen from carbonate formations. TAGD uses an array of downhole heaters installed in horizontal wells to heat the reservoir via thermal conduction.

THAI—TOE TO HEEL AIR INJECTION
THAI uses a vertical air injection well with a horizontal production well. Rather than steam, THAI technology injects air and then relies on underground combustion of a portion of the oil in the ground to generate the heat required to melt the remainder of the bitumen and allow it to flow into the production well. The process is intended to reduce greenhouse gas emissions and water use.

Project listings

Updated status of oil sands projects in Alberta

As of November 2012

NORTH ATHABASCA REGION — MINING

CANADIAN NATURAL RESOURCES LIMITED

Horizon

Canadian Natural has signed an agreement with Williams Energy Canada where Williams will invest between $500 million and $600 million to extract, transport, fractionate, own and market natural gas liquids and olefins captured from offgas produced at the Horizon upgrader. This is expected to significantly decrease greenhouse gas emissions from the project.

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Phase 1	135,000	2008	Operating	Mining
Phase 2A	10,000	2014	Approved	Mining
Phase 2B	45,000	TBD	Approved	Mining
Phase 3	80,000	TBD	Approved	Mining
Tranche 2	5,000	2012	Operating	Mining

IMPERIAL OIL LIMITED

Kearl

Imperial Oil says that as of the end of Q2/2012 Kearl Phase 1 is 94 per cent complete, with construction 88 per cent complete. All modules fabricated in Korea and transported through North America have now arrived at site and are being reassembled and integrated into the plant.

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Phase 1	110,000	2012	Construction	Mining
Phase 2	110,000	2015	Construction	Mining
Phase 3 Debottleneck	70,000	2020	Approved	Mining

SHELL ALBIAN SANDS

Jackpine

The Government of Canada's joint review panel reviewing the proposed Jackpine mine expansion has determined that it has sufficient information to proceed to a public hearing. The hearing commenced on Oct. 29, 2012 at MacDonald Island Park in Fort McMurray.

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Expansion	100,000	2017	Application	Mining
Phase 1A	100,000	2010	Operating	Mining
Phase 1B	100,000	TBD	Approved	Mining

Muskeg River

Shell reports that the Athabasca Oil Sands Project (Muskeg River and Jackpine) has now reached the milestone of 400 million barrels of cumulative production.

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Commercial	155,000	2002	Operating	Mining
Expansion & Debottlenecking	115,000	TBD	Approved	Mining

Pierre River

A joint review panel of the Canadian Environmental Assessment Agency and Energy Resources Conservation Board has been established to review the proposed Pierre River mine project. The timeline for the joint review panel to submit its report is 550 days (18 months) from coming into force in July 2012.

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Phase 1	100,000	2018	Application	Mining
Phase 2	100,000	TBD	Application	Mining

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
SUNCOR ENERGY INC.				
Base Operations				
Suncor says it has its tailings reduction operations infrastructure project and commenced operations. It is also in the process of starting up the hydrotreating unit and hydrogen plant of the new Millennium Naphtha Unit, which is expected to stabilize secondary upgrading capacity and provide flexibility during maintenance activities for secondary upgrading units in the future.				
Millennium Debottlenecking	23,000	2008	Operating	Mining
Millennium Mine	294,000	1967	Operating	Mining
North Steepbank Extension	180,000	2012	Operating	Mining
Steepbank Debottleneck Phase 3	4,000	2007	Operating	Mining
Fort Hills				
Suncor expects to present development plans to the board of directors for a sanctioning decision in 2013.				
Debottleneck	25,000	TBD	Approved	Mining
Phase 1	165,000	2016	Approved	Mining
Voyageur South				
Suncor considers Voyageur South to be a "longer-term" project and has not confirmed a start-up date.				
Phase 1	120,000	TBD	Application	Mining
SYNCRUDE CANADA LTD.				
Mildred Lake/Aurora				
Syncrude has announced it is embarking on a new mine extension project at Mildred Lake, which will be known as the MLX project. Canadian Oil Sands says MLX will leverage investment in the two mine trains currently being constructed, enabling Syncrude to extend the life of Mildred Lake mining operations by about a decade. Project scoping is underway, and pending regulatory approval, construction and spending would commence in the next 10 years.				
Aurora South Train 1	100,000	2016	Approved	Mining
Aurora South Train 2	100,000	2018	Approved	Mining
Base Mine Stage 1 & 2 Expansion	290,700	1978	Operating	Mining
Stage 3 Expansion	116,300	2006	Operating	Mining
TECK RESOURCES LIMITED				
Frontier				
Teck says it anticipates receiving the final supplemental information requests relating to the Frontier regulatory application in Q3/2012 and responding in Q4.				
Phase 1	75,000	2021	Application	Mining
Phase 2	80,000	2024	Application	Mining
Phase 3	80,000	2027	Application	Mining
Phase 4 Equinox	40,000	2030	Application	Mining
TOTAL E&P CANADA LTD.				
Joslyn North Mine				
Project partner Suncor Energy says submit development plans will be submitted to the companies' respective boards of directors for a sanctioning decision in 2013.				
Phase 1	100,000	2018	Approved	Mining
NORTH ATHABASCA REGION — IN SITU				
ATHABASCA OIL CORPORATION				
Birch				
AOS says that $26.3 million was spent on Birch in the first half of the year on its winter drilling and 3-D seismic programs. These both support the filing of its regulatory application, which is anticipated by the end of 2012.				
Phase 1	12,000	TBD	Announced	SAGD
Dover West Carbonates (Leduc)				
AOS says testing of its TAGD technology has demonstrated proof of concept. Design-basis memorandum engineering for the demonstration project is wrapping up, and engineering design specifications work has begun. Construction has started on a heater assembly facility outside of Strathmore, Alta.				
Phase 1 Demonstration	6,000	2015	Application	TAGD
Phase 2 Demonstration	6,000	TBD	Application	TAGD
Dover West Sands & Clastics				
AOS says the first round of supplemental information requests relating to its application have been received and design-basis memorandum engineering is progressing.				
Phase 1	12,000	2015	Application	SAGD
Phase 2	35,000	2018	Announced	SAGD
Phase 3	35,000	2020	Announced	SAGD
BP P.L.C.				
Terre de Grace				
BP says that ongoing appraisal activities include delineation drilling, seismic acquisition and appraisal of water sources.				
Pilot	10,000	TBD	Approved	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
CANADIAN NATURAL RESOURCES LIMITED				
Birch Mountain				
Canadian Natural says geological scoping is underway.				
Phase 1	60,000	2019	Announced	SAGD
Phase 2	60,000	2023	Announced	SAGD
CENOVUS ENERGY INC.				
East McMurray				
Phase 1	30,000	TBD	Announced	SAGD
Steepbank				
Phase 1	30,000	TBD	Announced	SAGD
Telephone Lake Borealis				
Cenovus says it has finished its search for a strategic partner for Telephone Lake and instead will go it alone on the project. Regulators have sent a supplemental information request regarding the application and are awaiting response.				
Phase A	45,000	TBD	Application	SAGD
Phase B	45,000	TBD	Application	SAGD
DOVER OPERATING CORP.				
Dover				
The director of environmental assessment has notified the ERCB that the environmental impact assessment report for the project is complete.				
Dover North Phase 1	50,000	2016	Application	SAGD
Dover North Phase 2	50,000	2018	Application	SAGD
Dover South Phase 3	50,000	2020	Application	SAGD
Dover South Phase 4	50,000	2022	Application	SAGD
Dover South Phase 5	50,000	2024	Application	SAGD
Muskay River				
ERCB project approval granted January 2012. Dover OpCo says construction is underway.				
Phase 1	35,000	2014	Construction	SAGD
Phase 2	40,000	2017	Approved	SAGD
Phase 3	40,000	2019	Approved	SAGD
Phase 4	35,000	TBD	Approved	SAGD
E-T ENERGY LTD.				
Papine Creek				
E-T Energy has reinstated Bruce McGee as CEO based on his technological expertise as it works on pilot operations to support a new commercial project application. Its previous application was denied by the ERCB earlier this year.				
Experimental Pilot	1,000	2007	Operating	ET-DSP
Phase 1	10,000	TBD	Announced	ET-DSP
Phase 2	40,000	TBD	Announced	ET-DSP
GRIZZLY OIL SANDS ULC				
Thickwood				
Phase 1	10,000	2017	Announced	SAGD
HUSKY ENERGY INC.				
Saleski				
Husky says evaluation work continues, as does design-basis memorandum work for the pilot plant and initial field environmental monitoring. These activities will support a regulatory application.				
Carbonate Pilot	TBD	2016	Announced	TBD
Sunrise				
Husky says drilling and engineering are complete. Field facilities are 50 per cent complete, and the central processing facility is 30 per cent complete. Permanent power has been installed, and its fly-in/fly-out program is up and running.				
Phase 1	60,000	2014	Construction	SAGD
Phase 2	50,000	2016	Approved	SAGD
Phase 3	50,000	TBD	Approved	SAGD
Phase 4	50,000	TBD	Approved	SAGD
IMPERIAL OIL LIMITED				
Aspen				
Phase 1	40,000	TBD	Announced	SAGD
IVANHOE ENERGY INC.				
Tamarack				
Ivanhoe says it has received and responded to the second round of supplemental information requests regarding its project application from the ERCB. It continues to expect approval in 2012.				
Phase 1	20,000	TBD	Application	SAGD
Phase 2	20,000	TBD	Application	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
MARATHON OIL CORPORATION				
Birchwood				
Marathon says that based on results of completed appraisal drilling, a regulatory application will be filed in 2012.				
Demonstration	12,000	2016	Application	SAGD
N-SOLV CORPORATION				
Dover				
Reports are that first results from a $60-million N-Solv field test are expected in spring 2013.				
Demonstration Plant	500	2013	Construction	N-SOLV
OAK POINT ENERGY LTD.				
Lewis				
Pilot	1,720	2013	Application	SAGD
SILVERWILLOW ENERGY CORPORATION				
Audet				
SilverWillow says it is continuing the analysis of data gained from the winter field program and has initiated reservoir simulation studies and a geo-mechanical evaluation program to better assess caprock. Tender packages for preliminary engineering of production facilities and environmental and regulatory support have been prepared, to be awarded in Q3. Regulatory application to be filed in 2013.				
Pilot	12,000	2016	Announced	SAGD
SOUTHERN PACIFIC RESOURCE CORP.				
STP McKay				
Southern Pacific says operations are progressing as planned, with the first of the well pairs now being converted from steam circulation to bitumen production.				
Phase 1	12,000	2012	Operating	SAGD
Phase 1 Expansion	6,000	2014	Application	SAGD
Phase 2A	12,000	2017	Application	SAGD
Phase 2B	6,000	2017	Application	SAGD
SUNCOR ENERGY INC.				
Firebag				
Suncor reports that production at Firebag has now reached 120,000 barrels per day, as ramp-up continues at Stage 3. Stage 4 has also now been successfully commissioned, and steaming of the wells has begun. First oil is expected by year-end, three months ahead of schedule and 10 per cent under the $2-billion estimate.				
Cogeneration and Expansion	25,000	2007	Operating	SAGD
Stage 1	35,000	2004	Operating	SAGD
Stage 2	35,000	2006	Operating	SAGD
Stage 3	62,500	2011	Operating	SAGD
Stage 3-6 Debottleneck	27,000	TBD	Application	SAGD
Stage 4	62,500	2013	Operating	SAGD
Stage 5	62,500	2018	Approved	SAGD
Stage 6	62,500	2019	Approved	SAGD
Lewis				
Phase 1	40,000	TBD	Application	SAGD
Phase 2	40,000	TBD	Application	SAGD
MacKay River				
Suncor planned to complete routine maintenance at MacKay River over the end of Q3 and the start of Q4/2012.				
MR2	40,000	2016	Application	SAGD
Phase 1	33,000	2002	Operating	SAGD
SUNSHINE OILSANDS LTD.				
Harper				
Sunshine says that steam cycle injection operations at Harper have proved thermally induced oil mobility.				
Carbonate Pilot	1,000	2011	Operating	SAGD
Legend Lake				
Sunshine says it has received a supplemental information request from the ERCB relating to the project application and will respond in the near term.				
A Phase 1	10,000	2016	Application	SAGD
A Phase 2	20,000	TBD	Announced	SAGD
B Phase 1	20,000	TBD	Announced	SAGD
Thickwood				
Sunshine says FEED has been initiated for the Thickwood project. The company has also submitted its responses to the ERCB's supplemental information requests relating to the project application.				
A Phase 1	10,000	2015	Application	SAGD
A Phase 2	20,000	2018	Announced	SAGD
B Phase 1	20,000	2021	Announced	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
West Ells				
Sunshine says construction at West Ells is on time and on budget. The central processing facility site has been cleared, FEED is complete, all long-lead equipment has been ordered and 75 per cent of secondary long-lead equipment has been procured. No major delays have been encountered to-date.				
A Phase 1	5,000	2013	Construction	SAGD
A Phase 2	5,000	2014	Approved	SAGD
A Phase 3	20,000	2018	Announced	SAGD
B Phase 1	20,000	2020	Announced	SAGD
B Phase 2	20,000	TBD	Announced	SAGD
C Phase 1	30,000	TBD	Announced	SAGD
SOUTH ATHABASCA REGION — IN SITU				
ALBERTA OILSANDS INC.				
Clearwater West				
Alberta Oilsands says it has responded to a third round of supplemental information requests from the ERCB regarding the project application. The company expects the regulator will hold a public hearing into the project due in part to its proximity to the Fort McMurray airport.				
Phase 1 Pilot	4,350	TBD	Application	SAGD
Phase 2	25,000	2016	Announced	SAGD
ATHABASCA OIL CORPORATION				
Hangingstone				
Regulatory approval was received for the first phase of the Hangingstone project in October, and will now be presented to the ATH board of directors for sanction. The company says FEED is complete and procurement of long-lead items is well underway.				
Phase 1	12,000	2014	Approved	SAGD
Phase 2	35,000	2017	Announced	SAGD
Phase 3	35,000	2019	Announced	SAGD
BLACKPEARL RESOURCES INC.				
Blackrod				
BlackPearl is planning to drill a second horizontal well pair at its operating pilot in Q1/2013 in order to test alternative operating strategies to those that have already provided commercial production rates. The company is nearing completion of FEED for the commercial project, which will lead to the award of an EPC contract later this year.				
Phase 1	20,000	2015	Application	SAGD
Phase 2	30,000	2018	Application	SAGD
Phase 3	30,000	2021	Application	SAGD
Pilot	800	2011	Operating	SAGD
CANADIAN NATURAL RESOURCES LIMITED				
Gregoire Lake				
Canadian Natural says geological scoping is underway.				
Phase 1	40,000	2021	Announced	TBA
Phase 2	40,000	2025	Announced	TBA
Grouse				
Canadian Natural says design basis memorandum engineering is progressing on track with completion targeted this year.				
Commercial	50,000	2017	Application	SAGD
Kirby North				
Canadian Natural says the 2012 stratigraphic test well drilling program is complete and procurement of long-lead items is progressing.				
Phase 1	40,000	2016	Application	SAGD
Phase 2	40,000	2019	Application	SAGD
Kirby South				
Canadian Natural says construction of Phase 1 was 53 per cent complete at the end of Q2 and remains on schedule. Drilling is nearing completion on the fourth of seven pads with wells confirming geological expectations.				
Phase 1	40,000	2013	Construction	SAGD
Phase 2	20,000	2020	Application	SAGD
CAVALIER ENERGY INC.				
Hoole				
Cavalier says it remains on schedule to submit the regulatory application for Hoole's first phase in Q4/2012.				
Phase 1	10,000	2016	Announced	SAGD
Phase 2	30,000	TBD	Announced	SAGD
Phase 3	30,000	TBD	Announced	SAGD
Phase 4	30,000	TBD	Announced	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
CENOVUS ENERGY INC.				
Christina Lake				
Alberta Environment has issued the proposed Terms of Reference for Christina Lake Phase H, which were available for public comment until Oct. 5. During Q3, Cenovus says production at Christina Lake averaged more than 64,000 barrels per day and achieved a one-day record of more than 87,000 barrels per day. Phase D continues to ramp up. Construction of Phase E is approximately 60 per cent complete, while initial site preparation and the purchase of equipment continue at Phase F and engineering and design are underway for Phase G.				
Phase 1A	10,000	2002	Operating	SAGD
Phase 1B	8,800	2008	Operating	SAGD
Phase C	40,000	2011	Operating	SAGD
Phase D	40,000	2012	Operating	SAGD
Phase E	40,000	2013	Construction	SAGD
Phase F	50,000	2016	Approved	SAGD
Phase G	50,000	2017	Approved	SAGD
Phase H	50,000	2019	Announced	SAGD
Foster Creek				
Alberta Environment has issued its final terms of reference for the environmental impact assessment for Phase J. Cenovus says overall construction at the combine Phase F, G and H expansion is approximately 33 per cent complete. First production from Phase F is expected in 2014. Facility construction, offsite fabrication and equipment purchasing are underway at Phase G and engineering is underway for Phase H.				
Phase A	24,000	2001	Operating	SAGD
Phase B Debottleneck	6,000	2003	Operating	SAGD
Phase C Stage 1	10,000	2005	Operating	SAGD
Phase C Stage 2	20,000	2007	Operating	SAGD
Phase D	30,000	2009	Operating	SAGD
Phase E	30,000	2009	Operating	SAGD
Phase F	45,000	2014	Construction	SAGD
Phase G	40,000	2015	Approved	SAGD
Phase H	40,000	2016	Approved	SAGD
Phase J	55,000	2019	Announced	SAGD
Narrows Lake				
Cenovus broke ground at Narrows Lake on Sept. 25. Project sanction for Phase 1 is expected by Cenovus and ConocoPhillips by the end of 2012.				
Phase 1	45,000	2017	Approved	SAGD
Phase 2	45,000	TBD	Approved	SAGD
Phase 3	40,000	TBD	Approved	SAGD
Pelican Lake Grand Rapids				
At the Grand Rapids pilot, construction is progressing on the installation of a third mobile steam generator, and steam injection has started on the second well pair.				
Phase A	60,000	2017	Application	SAGD
Phase B	60,000	TBD	Application	SAGD
Phase C	60,000	TBD	Application	SAGD
Pilot	600	2011	Operating	SAGD
West Kirby				
Phase 1	30,000	TBD	Announced	SAGD
Winefred Lake				
Phase 1	30,000	TBD	Announced	SAGD
CONNACHER OIL AND GAS LIMITED				
Algar				
Connacher has sold two subsidiaries for proceeds of approximately $200 million, which the company says positions it to "execute a meaningful capital program" including projects designed to increase production and improve netbacks at Algar and Great Divide Pod 1. This could increase production by as much as 5,000 barrels per day over the next 15 to 24 months.				
Pod 2	10,000	2010	Operating	SAGD
Great Divide				
Connacher received regulatory approval for the two-phase 24,000-barrel-per-day expansion at Great Divide in late September. The company says the approval allows it to advance its evaluation of project costs, timing and financing alternatives.				
Expansion 1A	12,000	2014	Approved	SAGD
Expansion 1B	12,000	2016	Approved	SAGD
Pod 1	10,000	2007	Operating	SAGD
CONOCOPHILLIPS CANADA LIMITED				
Surmont				
ConocoPhillips Canada says engineering for Surmont 2 is expected to be complete and the majority of materials and equipment delivered to site by year-end, in anticipation of peak construction in 2013.				
Phase 1	27,000	2007	Operating	SAGD
Phase 2	109,000	2015	Construction	SAGD
Pilot	1,200	1997	Operating	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
DEVON CANADA CORPORATION				
Jackfish				
Devon says ramp-up of Jackfish 2 is now approximately two-thirds complete, while construction of the Jackfish 3 project is now approximately 40 per cent complete.				
Phase 1	35,000	2007	Operating	SAGD
Phase 2	35,000	2011	Operating	SAGD
Phase 3	35,000	2015	Construction	SAGD
Jackfish East				
Expansion	20,000	2018	Announced	SAGD
Pike				
Devon filed the regulatory application for all three phases of the Pike project in June. The company says facility construction and SAGD drilling for the first phase will begin in late 2013 or early 2014, pending corporate approvals. The company has also submitted its environmental impact assessment report for the project.				
1A	35,000	2016	Application	SAGD
1B	35,000	2017	Application	SAGD
1C	35,000	2018	Application	SAGD
GRIZZLY OIL SANDS ULC				
Algar Lake				
SAGD well pair drilling and completions for Phase 1 is underway. In-field plant assembly started in Q3, while commissioning is expected to start in Q4. First bitumen production is anticipated in Q2/2013.				
Phase 1	5,650	2013	Construction	SAGD
Phase 2	5,650	2014	Approved	SAGD
May River				
Grizzly says it anticipates full-field development of its May River asset to ultimately produce more than 75,000 barrels per day using SAGD and its ARMS development model. A new application is to be filed in mid-2013.				
Phase 1	10,000	TBD	Disclosed	SAGD
Subsequent Phases	90,000	TBD	Disclosed	SAGD
HARVEST OPERATIONS CORP.				
BlackGold				
On Oct. 11, Harvest supplemental information to Alberta Environment regarding the BlackGold expansion project, which is now under review.				
Phase 1	10,000	2014	Construction	SAGD
Phase 2	20,000	TBD	Application	SAGD
HUSKY ENERGY INC.				
McMullen				
Husky says that during Q2 eight slant wells that were drilled in late 2011 were put on cold production. Drilling operations for 32 further slant wells began in June. At the air injection pilot, the reservoir process is proceeding with production start-up anticipated in Q3.				
Air Injection Pilot-Experimental	755	2012	Construction	SAGD
JAPAN CANADA OIL SANDS LIMITED				
Hangingstone				
The director of environmental assessment has notified the ERCB that the environmental impact assessment for the expansion project is complete. JACOS owner Japan Petroleum Exploration says it will make a final investment decision by the end of this year, pending approvals from Alberta regulators.				
Expansion	35,000	2016	Application	SAGD
Hangingstone Pilot				
Pilot	11,000	1999	Operating	SAGD
KOCH EXPLORATION CANADA CORPORATION				
Muskwa				
Koch's Canadian subsidiaries are seeking a strategic investor to advance development and monetize certain oil sands interests including the Muskwa asset.				
Pilot	10,000	2015	Application	SAGD
LARICINA ENERGY LTD.				
Germain				
Laricina says detailed engineering is essentially complete, 28 of 77 modules have been installed on site, approximately 50 per cent of modules are under fabrication, and regulatory consultation for the 150,000-barrel-per-day expansion continues as planned.				
Phase 1 CDP	5,000	2013	Construction	SAGD
Phase 2	30,000	2015	Application	SAGD
Phase 3	60,000	TBD	Application	SAGD
Phase 4	60,000	TBD	Application	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Saleski				
Laricina says testing on its latest well pair at Saleski has resulted in greatest bitumen production achieved to-date at 1,200 barrels per day. The company says it is now in the final stages of proving commerciality of SAGD in bitumen carbonates. It also says it is now considering incorporating cyclic steam stimulation into the 10,700-barrel-per-day project application.				
Experimental Pilot	1,800	2011	Operating	SAGD
Phase 1	10,700	2014	Application	SAGD
MEG ENERGY CORPORATION				
Christina Lake				
MEG says that during Q3, key facilities were tied in to existing operations in preparation for completion of the Christina Lake Phase 2B project, which remains on track and on budget for start-up in the second half of 2013.				
Phase 1 Pilot	3,000	2008	Operating	SAGD
Phase 2A	22,000	2009	Operating	SAGD
Phase 2B	35,000	2013	Construction	SAGD
Phase 3A	50,000	2016	Approved	SAGD
Phase 3B	50,000	2018	Approved	SAGD
Phase 3C	50,000	2020	Approved	SAGD
Surmont				
MEG's application for the phased Surmont SAGD project was filed in September. Public consultation is ongoing.				
Phase 1	41,000	2018	Application	SAGD
Phase 2	41,000	TBD	Application	SAGD
Phase 3	41,000	TBD	Application	SAGD
NEXEN INC.				
Long Lake				
Nexen says it continues to make good progress on initiatives to fill the Long Lake upgrader. A major turnaround initiated in August is now complete.				
Long Lake South (Kinosis) Phase 1	40,000	TBD	Approved	SAGD
Long Lake South (Kinosis) Phase 2	40,000	TBD	Approved	SAGD
Phase 1	72,000	2008	Operating	SAGD
Phase 2	72,000	TBD	Approved	SAGD
Phase 3	72,000	TBD	Application	SAGD
Phase 4	72,000	TBD	Announced	SAGD
STATOIL				
Kai Kos Dehseh				
Statoil says its next projects will be an expansion to Leismer, and the Corner project. Corner will be sanctioned late in 2013 or early in 2014. The company has appointed a new president of its Canadian operations, Stale Tungesvik.				
Corner	40,000	2017	Approved	SAGD
Corner Expansion	40,000	TBD	Application	SAGD
Hangingstone	20,000	TBD	Application	SAGD
Leismer Commercial	10,000	TBD	Approved	SAGD
Leismer Demonstration	10,000	2010	Operating	SAGD
Leismer Expansion	20,000	TBD	Approved	SAGD
Leismer Northwest	20,000	TBD	Application	SAGD
Leismer South	20,000	TBD	Application	SAGD
Thornbury	40,000	TBD	Application	SAGD
Thornbury Expansion	20,000	TBD	Application	SAGD
SUNCOR ENERGY INC.				
Chard				
Phase 1	40,000	TBD	Announced	SAGD
Meadow Creek				
Phase 1	40,000	TBD	Approved	SAGD
Phase 2	40,000	TBD	Approved	SAGD
SURMONT ENERGY LTD.				
Wildwood				
Surmont filed its regulatory application in early October, almost exactly one year after being incorporated as a company.				
Phase 1	12,000	2015	Application	SAGD
VALUE CREATION INC.				
Advanced TriStar				
Value Creation says it is preparing the regulatory application for the Advanced TriStar project. Alberta Environment has issued its final terms of reference for the project's environmental assessment.				
ATS-1	15,000	2016	Application	SAGD
ATS-2	30,000	2018	Application	SAGD
ATS-3	30,000	2020	Application	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
TriStar				
Value Creation is providing the ERCB with additional information supporting its application.				
Pilot	1,000	2014	Application	SAGD
COLD LAKE REGION — IN SITU				
BIRCHWOOD RESOURCES INC.				
Sage				
Birchwood has released its public disclosure document and has held an open house with area residents, some of whom were concerned by the development.				
Pilot	5,000	2015	Announced	SAGD
CANADIAN NATURAL RESOURCES LIMITED				
Primrose & Wolf Lake				
Canadian Natural says pads at Primrose are now entering back into the production cycle. The company targets to maximize steam plant capacity through the completion of low cost pad-add projects; projects currently under construction are on schedule and on budget.				
Primrose East	32,000	2008	Operating	CSS
Primrose North	30,000	2006	Operating	CSS
Primrose South	45,000	1985	Operating	CSS
Wolf Lake	13,000	1985	Operating	CSS
DEVON CANADA CORPORATION				
Walleye				
Devon filed its regulatory application for Walleye in June. The company says construction will start in 2013.				
Phase 1	9,000	2016	Application	SAGD
HUSKY ENERGY INC.				
Caribou				
Demonstration	10,000	TBD	Approved	SAGD
Tucker				
Phase 1	30,000	2006	Operating	SAGD
IMPERIAL OIL LIMITED				
Cold Lake				
Imperial says that the Nabiye expansion was 27 per cent complete at the end of Q2.				
Phase 1-10	110,000	1985	Operating	CSS
Phase 11-13	30,000	2002	Operating	CSS
Phase 14-16	40,000	2014	Construction	CSS
KOCH EXPLORATION CANADA CORPORATION				
Gemini				
Koch has sold its Gemini asset to Baytex Energy Corp. for $120 million cash.				
Stage 1	1,200	TBD	Approved	SAGD
Stage 2	10,000	TBD	Approved	SAGD
OSUM OIL SANDS CORP.				
Taiga				
OSUM received regulatory approval for the 35,000-barrel-per-day Taiga project. The company says it is now considering financing options.				
Phase 1	23,000	2016	Approved	SAGD
Phase 2	22,000	2017	Approved	SAGD
PENGROWTH ENERGY CORPORATION				
Lindbergh				
Pengrowth says its two well pairs at Lindbergh are now producing after a faster-than-anticipated reservoir response.				
Phase 1 Commercial	12,500	2015	Application	SAGD
Phase 2 Commercial	17,500	2016	Announced	SAGD
Pilot	1,200	2012	Operating	SAGD
ROYAL DUTCH SHELL PLC				
Orion				
Shell is looking to sell the Orion property, reportedly to focus on in situ operations at Peace River.				
Phase 1	10,000	2007	Operating	SAGD
Phase 2	10,000	TBD	Approved	SAGD
PEACE RIVER REGION — IN SITU				
ANDORA ENERGY CORPORATION				
Sawn Lake				
PanOrient Energy Corp. has increased its ownership of Andora Energy from 52.5 per cent to 71.8 per cent. PanOrient says activities are underway to commence steam injection at the Sawn Lake SAGD demonstration in Q2/2013, with production anticipated in Q4/2013.				
SAGD Demonstration	1,400	2013	Approved	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
NORTHERN ALBERTA OIL LTD.				
Sawn Lake				
Company owner Deep Well Oil & Gas says DeGolyer & MacNaughton Canada has completed its reservoir modelling for a proposed horizontal cyclic steam stimulation pilot at Sawn Lake, concluding the project would yield commercial viable extraction. Deep Well is currently preparing a pilot plan and options for capitalization.				
CSS Pilot	700	TBD	Approved	CSS
PENN WEST PETROLEUM LTD.				
Harmon Valley South				
Pilot	TBD	TBD	Application	CSS
Seal Main				
Commercial	10,000	2015	Application	CSS
Pilot	75	2011	Operating	CSS
PETROBANK ENERGY AND RESOURCES LTD.				
Dawson				
Petrobank says it is awaiting regulatory approval to initiate cold production on its two well demonstration project to condition the reservoir prior to THAI operations.				
Experimental THAI Demonstration	10,000	2013	Construction	THAI
Phase 2	10,000	TBD	Announced	THAI
ROYAL DUTCH SHELL PLC				
Peace River				
Alberta's environmental assessment director has deemed complete Shell Canada's environmental impact assessment report for the Carmon Creek expansion.				
Cadotte Lake	12,500	1986	Operating	CSS
Carmon Creek - Phase 1	40,000	2015	Application	CSS
Carmon Creek - Phase 2	40,000	2018	Application	CSS
SOUTHERN PACIFIC RESOURCE CORP.				
Red Earth				
Southern Pacific is analyzing results from its latest CSS test at Red Earth. The company said it would finalize future development plans by the end of Q2.				
Commercial	10,000	TBD	Announced	CSS
Pilot	1,000	2009	Operating	CSS
Pilot Expansion	3,000	TBD	Announced	CSS
NORTH ATHABASCA REGION — UPGRADER				
BP P.L.C.				
Terre de Grace				
BP says that ongoing appraisal activities include delineation drilling, seismic acquisition and appraisal of water sources.				
Pilot	8,400	TBD	Approved	Upgrader
CANADIAN NATURAL RESOURCES LIMITED				
Horizon				
Canadian Natural has signed an agreement with Williams Energy Canada where Williams will invest between $500 million and $600 million to extract, transport, fractionate, own and market natural gas liquids and olefins captured from offgas produced at the Horizon upgrader. This is expected to significantly decrease greenhouse gas emissions from the project.				
Phase 1	114,000	2009	Operating	Upgrader
Phase 2A	10,000	2014	Approved	Upgrader
Phase 2B	45,000	TBD	Approved	Upgrader
Phase 3	80,000	TBD	Approved	Upgrader
Tranche 2	5,000	2012	Operating	Upgrader
IVANHOE ENERGY INC.				
Tamarack				
Ivanhoe says it has received and responded to the second round of supplemental information requests regarding its project application from the ERCB. It continues to expect approval in 2012.				
Phase 1	34,784	2014	Application	Upgrader
SUNCOR ENERGY INC.				
Base Operations				
Suncor says it has its tailings reduction operations infrastructure project and commenced operations. It is also in the process of starting up the hydrotreating unit and hydrogen plant of the new Millennium Naphtha Unit, which is expected to stabilize secondary upgrading capacity and provide flexibility during maintenance activities for secondary upgrading units in the future.				
Millennium Coker Unit	97,000	2008	Operating	Upgrader
Millennium Vacuum Unit	35,000	2005	Operating	Upgrader
U1 and U2	225,000	1967	Operating	Upgrader

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Fort Hills				
Suncor expects to present development plans to the board of directors for a sanctioning decision in 2013.				
Phase 1	145,000	TBD	On Hold	Upgrader
Phase 2 & 3	145,000	TBD	On Hold	Upgrader
Voyageur Upgrader 3				
Suncor says that current work is on validating project scope, developing the project execution plan, engineering and progressing site preparation. The company and its partner plan to submit development plans to their respective boards of directors for sanction in 2013.				
Phase 1	127,000	2016	Approved	Upgrader
Phase 2	63,000	TBD	Approved	Upgrader
SYNCRUDE CANADA LTD.				
Mildred Lake/Aurora				
Syncrude has announced it is embarking on a new mine extension project at Mildred Lake, which will be known as the MLX project. Canadian Oil Sands says MLX will leverage investment in the two mine trains currently being constructed, enabling Syncrude to extend the life of Mildred Lake mining operations by about a decade. Project scoping is underway, and pending regulatory approval, construction and spending would commence in the next 10 years.				
Base Plant Stage 1 & 2 Debottleneck	250,000	1978	Operating	Upgrader
Stage 3 Debottleneck	75,000	TBD	Announced	Upgrader
Stage 3 Expansion (UE-1)	100,000	2006	Operating	Upgrader
SOUTH ATHABASCA REGION — UPGRADER				
NEXEN INC.				
Long Lake				
Nexen says it continues to make good progress on initiatives to fill the Long Lake upgrader. A major turnaround initiated in August is now complete.				
Phase 1	58,500	2008	Operating	Upgrader
Phase 2	58,500	TBD	Approved	Upgrader
Phase 3	58,500	TBD	Application	Upgrader
Phase 4	58,500	TBD	Announced	Upgrader
VALUE CREATION INC.				
Advanced TriStar				
Value Creation says it is preparing the regulatory application for the Advanced TriStar project. Alberta Environment has issued its final terms of reference for the project's environmental assessment.				
ATS-1	12,750	2016	Application	Upgrader
ATS-2	25,500	2018	Application	Upgrader
ATS-3	25,500	2020	Application	Upgrader
TriStar				
Value Creation is providing the ERCB with additional information supporting its application.				
Pilot	840	2014	Application	Upgrader
INDUSTRIAL HEARTLAND REGION — UPGRADER				
NORTH WEST UPGRADING INC.				
Redwater Upgrader				
Partners CNRL and North West Upgrading have sanctioned the project. Above-ground construction is expected to commence in spring 2013.				
Phase 1	77,000	2016	Approved	Upgrader
Phase 2	77,000	TBD	Approved	Upgrader
Phase 3	77,000	TBD	Approved	Upgrader
SHELL ALBIAN SANDS				
Scotford Upgrader 1				
Summer 2012 marked the 10th anniversary of the opening of the Athabasca Oil Sands Project.				
Commercial	158,000	2003	Operating	Upgrader
Expansion	91,000	2011	Operating	Upgrader
VALUE CREATION INC.				
Heartland				
Construction was suspended in September 2008.				
Phase 1	46,300	TBD	On Hold	Upgrader
Phase 2	46,300	TBD	Approved	Upgrader
Phase 3	46,300	TBD	Approved	Upgrader

Glossary of oil sands terms

API

An American Petroleum Institute measure of liquid gravity. Water is 10 degrees API, and a typical light crude is from 35 to 40. Bitumen is 7.5 to 8.5.

Barrel

The traditional measurement for crude oil volumes. One barrel equals 42 U.S. gallons (159 litres). There are 6.29 barrels in one cubic metre of oil.

Bitumen

Naturally occurring, viscous mixture of hydrocarbons that contains high levels of sulphur and nitrogen compounds. In its natural state, it is not recoverable at a commercial rate through a well because it is too thick to flow. Bitumen typically makes up about 10 per cent by weight of oil sand, but saturation varies.

Condensate

Mixture of extremely light hydrocarbons recoverable from gas reservoirs. Condensate is also referred to as a natural gas liquid, and is used as a diluent to reduce bitumen viscosity for pipeline transportation.

Cyclic steam stimulation (CSS)

For several weeks, high-pressure steam is injected into the formation to soften the oil sand before being pumped to the surface for separation. The pressure created in the underground environment causes formation cracks that help move the bitumen to producing wells. After a portion of the reservoir has been saturated, the steam is turned off and the reservoir is allowed to soak for several weeks. Then the production phase brings the bitumen to the surface.

Density

The heaviness of crude oil, indicating the proportion of large, carbon-rich molecules, generally measured in kilograms per cubic metre (kg/m^3) or degrees on the American Petroleum Institute (API) gravity scale; in western Canada, oil up to 900 kg/m^3 is considered light-to-medium crude—oil above this density is deemed as heavy oil or bitumen.

Diluent

See *Condensate*

Established recoverable reserves

Reserves recoverable under current technology, and present and anticipated economic conditions, plus that portion of recoverable reserves that is interpreted to exist, based on geological, geophysical or similar information, with reasonable certainty.

Established reserves

Reserves recoverable with current technology, and present and anticipated economic conditions specifically proved by drilling, testing or production, plus the portion of contiguous recoverable reserves that are interpreted to exist from geological, geophysical or similar information with reasonable certainty.

Extraction

A process, unique to the oil sands industry, which separates the bitumen from the oil sand using hot water, steam and caustic soda.

Froth treatment

The means to recover bitumen from the mixture of water, bitumen and solids "froth" produced in hot-water extraction (in mining-based recovery).

Gasification

A process to partially oxidize any hydrocarbon, typically heavy residues, to a mixture of hydrogen and carbon monoxide. Can be used to produce hydrogen and various energy by-products.

Greenhouse gases

Gases commonly believed to be connected to climate change and global warming. CO_2 is the most common, but greenhouse gases also include other light hydrocarbons (such as methane) and nitrous oxide.

Initial established reserves

Established reserves prior to the deduction of any production.

Initial volume in place

The volume calculated or interpreted to exist in a reservoir before any volume has been produced.

In situ

Latin for "in place." In situ recovery refers to various methods used to recover deeply buried bitumen deposits.

In situ combustion

A displacement enhanced oil recovery method. It works by generating combustion gases (primarily CO and CO_2) downhole, which then "pushes" the oil towards the recovery well.

Lease

A legal document from the province of Alberta giving an operator the right to extract bitumen from the oil sand existing within the specified lease area. The land must be reclaimed and returned to the Crown at the end of operations.

Muskeg

A water-soaked layer of decaying plant material, one to three metres thick, found on top of the overburden.

Oil sands

Bitumen-soaked sand, located in four geographic regions of Alberta: Athabasca, Wabasca, Cold Lake and Peace River. The Athabasca deposit is the largest, encompassing more than 42,340 square kilometres. Total deposits of bitumen in Alberta are estimated at 1.7 trillion to 2.5 trillion barrels.

Overburden

A layer of sand, gravel and shale between the surface and the underlying oil sand. Must be removed before oil sands can be mined. Overburden underlies muskeg in many places.

Pilot plant

Small model plant for testing processes under actual production conditions.

Proven recoverable reserves

Reserves that have been proven through production or testing to be recoverable with existing technology and under present economic conditions.

Reclamation

Returning disturbed land to a stable, biologically productive state. Reclaimed property is returned to the province of Alberta at the end of operations.

Remaining established reserves

Initial reserves less cumulative production.

Royalty

The Crown's share of production or revenue. About three-quarters of Canadian crude oil is produced from lands, including the oil sands, on which the Crown holds mineral rights. The lease or permit between the developer and the Crown sets out the arrangements for sharing the risks and rewards.

Steam assisted gravity drainage (SAGD)

An in situ production process using two closely spaced horizontal wells: one for steam injection and the other for production of the bitumen/water emulsion.

Synthetic crude oil (SCO)

A manufactured crude oil comprised of naphtha, distillate and gas oil-boiling range material. Can range from high-quality, light sweet bottomless crude to heavy, sour blends.

Tailings

A combination of water, sand, silt and fine clay particles that are a by-product of removing the bitumen from the oil sand.

Tailings settling basin

The primary purpose of the tailings settling basin is to serve as a process vessel allowing time for tailings water to clarify and silt and clay particles to settle, so the water can be reused in extraction. The settling basin also acts as a thickener, preparing mature fine tails for final reclamation.

Thermal recovery

Any process by which heat energy is used to reduce the viscosity of bitumen in situ to facilitate recovery.

Toe to heel air injection (THAI)

An in situ combustion method for producing heavy oil and oil sand. In this technique, combustion starts from a vertical well, while the oil is produced from a horizontal well having its toe in close proximity to the vertical air-injection well. This production method is a modification of conventional fire flooding techniques in which the flame front from a vertical well pushes the oil to be produced from another vertical well.

Truck-and-shovel mining

Large electric or hydraulic shovels are used to remove the oil sand and load very large trucks. The trucks haul the oil sand to dump pockets where it is conveyed or pipelined to the extraction plant. Trucks and shovels are more economic to operate than the bucket-wheel reclaimers and draglines they have replaced at oil sands mines.

Upgrading

The process of converting heavy oil or bitumen into synthetic crude either through the removal of carbon (coking) or the addition of hydrogen (hydroconversion).

Vapour extraction (VAPEX)

VAPEX is a non-thermal recovery method that involves injecting a gaseous hydrocarbon solvent into the reservoir where it dissolves into the sludge-like oil, which becomes less viscous (or more fluid) before draining into a lower horizontal well and being extracted.

Viscosity

The ability of a liquid to flow. The lower the viscosity, the more easily the liquid will flow.

CONTACTS

Oil Sands Producers

- Alberta Oilsands — www.aboilsands.ca
- Andora Energy — www.andoraenergy.com
- Athabasca Oil Sands — www.athx.com
- Baytex Energy — www.baytex.ab.ca
- BlackPearl Resources — www.blackpearlresources.ca
- Canadian Natural Resources — www.cnrl.com
- Cenovus Energy — www.cenovus.com
- Chevron Canada — www.chevron.ca
- China National Offshore Oil Corporation — www.cnoocltd.com
- Connacher Oil and Gas — www.connacheroil.com
- ConocoPhillips Canada — www.conocophillips.ca
- Devon Canada — www.dvn.com
- Dover Operating Corp. — www.doveropco.com
- Enerplus Resources Fund — www.enerplus.com
- E-T Energy — www.e-tenergy.com
- Grizzly Oil Sands — www.grizzlyoilsands.com
- Harvest Operations Corp. — www.harvestenergy.ca
- Husky Energy — www.huskyenergy.ca
- Imperial Oil — www.imperialoil.ca
- Ivanhoe Energy — www.ivanhoeenergy.com
- Japan Canada Oil Sands — www.jacos.com
- Koch Exploration Canada — www.kochind.com
- Korea National Oil Corporation — www.knoc.co.kr
- Laricina Energy — www.laricinaenergy.com
- Marathon Oil — www.marathon.com
- MEG Energy — www.megenergy.com
- Nexen — www.nexeninc.com
- North West Upgrading — www.northwestupgrading.com
- N-Solv — www.n-solv.com
- Oak Point Energy — www.oakpointenergy.ca
- Occidental Petroleum Corporation — www.oxy.com
- Oilsands Quest — www.oilsandsquest.com
- OSUM Oil Sands — www.osumcorp.com
- Pan Orient Energy — www.panorient.ca
- Paramount Resources Ltd. — www.paramountres.com
- Pengrowth Energy Trust — www.pengrowth.com
- Petrobank Energy and Resources — www.petrobank.com
- PetroChina — www.petrochina.com.cn/Ptr
- Shell Canada — www.shell.ca
- Sinopec — www.english.sinopec.com
- Southern Pacific Resource Corp. — www.shpacific.com
- Statoil Canada — www.statoil.com
- Suncor Energy — www.suncor.com
- Sunshine Oilsands — www.sunshineoilsands.com
- Syncrude — www.syncrude.ca
- Talisman Energy — www.talisman-energy.com
- Teck Resources — www.teck.com
- Total E&P Canada — www.total-ep-canada.com
- Value Creation Group — www.vctk.com

Associations/Organizations

- Alberta Building Trades Council — www.buildingtradesalberta.ca
- Alberta Chamber of Resources — www.acr-alberta.com
- Alberta Chambers of Commerce — www.abchamber.ca
- Alberta Energy — www.energy.gov.ab.ca
- Alberta Enterprise and Advanced Education — www.eae.alberta.ca
- Alberta Innovates — www.albertainnovates.ca
- Alberta Environment and Sustainable Resource Development — www.srd.alberta.ca
- Alberta's Industrial Heartland Association — www.industrialheartland.com
- Canada's Oil Sands Innovation Alliance — www.cosia.ca
- Canadian Association of Geophysical Contractors — www.cagc.ca
- Canadian Association of Petroleum Producers — www.capp.ca
- Canadian Heavy Oil Association — www.choa.ab.ca
- Canadian Oil Sands Network for Research and Development — www.canadianoilsandsnetwork.ca
- Energy Resources Conservation Board — www.ercb.ca
- In Situ Oil Sands Alliance — www.iosa.ca
- Lakeland Industry and Community Association — www.lica.ca
- Natural Resources Conservation Board — www.nrcb.gov.ab.ca
- Oil Sands Developers Group — www.oilsandsdevelopers.ca
- Oil Sands Secretariat — www.finance.alberta.ca
- Petroleum Technology Alliance Canada — www.ptac.org

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